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ABSTRACT

The poorer performance of older people in laboratory tests of episodic memory may result from failures or deficiencies in metamemory processes, e.g., failure to monitor task or individual item difficulty. To study age differences in prediction of memory performance, an associative matching task was used to compare young (N=20) and older (N=20) adults' memory for a list of 60 unrelated paired associates. Metamemory measures, and prediction and response evaluation were also taken. A substantial age effect was found in memory performance. Young adults were correct on 50% of the pairs in associative matching, while older adults were correct on only 30%. The two age groups did not show any substantial difference in the accuracy of the predictive measure. Older adults underestimated task difficulty, however, showing a substantial overestimate of the number of correct associative matches they would make. Younger adults, on average, used the predictive scale accurately but were only slightly more accurate on the response evaluation measure. (Author/JAC)

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Prediction and Evaluation of Memory Performance by Young and Old Adults

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Abstract

Does the poorer performance of older people in laboratory tests of episodic memory result from a metamemory problem? Specifically, are they unable to optimize processing because of a failure in monitoring either a) the difficulty of the task, b) the relative difficulty of individual items, or c) the memorial effectiveness of their encoding for specific items?

This study compared young and old adults' memory for a list of 60 "unrelated" paired associates, measured by an associative matching task. Two metamemory measures were also taken: each pair was rated on a 5-point scale at the time of study for the likelihood that the person would recall it (Prediction measure), and after the associative matching task the person indicated for each pair whether it was a guess, they thought it to be correct, or were sure it was correct (Response Evaluation measure).

A substantial age effect was found in memory performance; young were correct on 50% of the pairs in associative matching while old were correct only 30%. The two age groups did not show any substantial difference in the accuracy of the Predictive measure; both were able to predict relative memorability. The old persons, however, seemed to underestimate the difficulty of the task, since their use of the 5-point scale showed a substantial overestimate on their part of the number of correct associative matches they would make (Young Ss did, on average, use the predictive scale in a veridical fashion.) The Young were only slightly more accurate in the Response Evaluation measure.

Introduction

Does the poorer performance of older persons on memory tasks result from failures or deficiencies in metamemory processes? There is evidence that certain types of metamemory may show no decline with age; "feelings-of-knowing" for information in semantic memory may well be as good in old as young adults (Lachman & Lachman, 1980). For metamemorial judgments of global performance level on episodic memory tasks, however, there is some evidence of age differences with older adults overestimating their performance, i.e., underestimating task difficulty (Murphy et al., 1981). When this study was undertaken there were no published data on age differences in judgments of the relative memorability of individual items at time of study in an episodic memory task; Rabinowitz et al. (1982) have since shown no age differences in the accuracy of such judgments.

The present data confirm the results of both Rabinowitz et al. (1982) and Murphy et al. (1981). That is, while there were no appreciable age difference in the accuracy of judgments of relative difficulty of items, the older adults used the scale in ways which indicated that, as a group, they expected to remember much more than they did, while the use of the scale for young adults was veridical, given their performance levels.

The present study also explored a second metamemorial judgment, the evaluation of the accuracy of their responses on the memory task. While young adults were slightly better at this task, both groups demonstrated high accuracy in this regard.

This study also sought evidence of a relationship of success in the memory task and electrocortical activity at time of study (cf. Sanquist et al., 1980). Since these data are not fully analyzed, and preliminary inspection of the data has not revealed striking effects, only the behavioral aspects of the study are reported here.

Method

Subjects. Young were 20 Duke students aged 17 to 24 ($\bar{X}$ = 18.9, S.D. = 1.4). Old were volunteers from pool maintained by Duke Aging Center, aged 60 to 75 ($\bar{X}$ = 66.9, S.D. = 5.7); all had attended college and were selected to exclude any with certain chronic health problems (e.g., hypertension, heart disease, stroke). Each group had 11 men and 9 women.

Materials. Sixty word pairs were formed by randomly pairing 120 nouns (Paivio et al., 1968) of high frequency and concreteness-imageability. No word in the pool was a synonym or judged to be a strong associate of any other word in the pool.

Apparatus. Electrodes were affixed to the scalp at F_z, C_z, and P_z with reference electrode at the left earlobe; eye movements were recorded by an electrode placed on the forehead. All the ERP data were stored trial by trial for later averaging.

The stimuli were generated and displayed by computer; words were displayed on a Tektronics Display Monitor with a 4" x 5" screen which was placed 30" in front of the subject at about chest level. The words were about 3" long and 3/4" high.

Procedure. After scalp electrodes were attached and a health questionnair completed, Ss were instructed that they were to try to remember the pairings of 60 unrelated word pairs (meaning of unrelated made explicit) and rate each for how likely they would be to correctly match that pair when later provided a list of all first members of pairs and all second members. A card with this rating scale remained in front of them:

1 - quite sure you will not recall it

2 - think you probably will not recall it

3 - not sure - equally likely that you will or won't

4 - think you probably will recall it

5 - quite sure you will recall it

The 2 words of each pair were flashed in the center of the CRT successively at a 1 sec. separation; about 3 sec. later a cue appeared on the screen signalling the S to rate that pair and then press a button to initiate presentation of the next pair. Seven practice pairs were presented to familiarize the S with the apparatus and to stabilize the use of the rating scale.

Following presentation of the 60 pairs, and a 3-min. interval when electrodes were removed, the S received a sheet with the two sets of words, and had to pair them again as they had been in presentation. This associative matching was self paced. When Ss finished the matching they were asked to indicate their confidence in the correctness of particular pairings by indicating that their response was a guess, they thought it was correct, or were quite sure it was correct.

Results

Study time. The distributions of total study time were very similar for Young and Old; nearly all Ss proceeded at a similar, steady rate of about 11 sec. per pair.

Memory Performance. Young were correct on the associative matching more often than older Ss, $t(38) = 3.87$, $p < .001$.

Young: $\bar{X} = 30$, S.D. = 10.6 (50% correct)

Old: $\bar{X} = 18$, S.D. = 8.6 (30% correct)

Accuracy of Predictions. When the probability of correct matching is conditionalized on ratings (see Figure 1), the ratings are seen to be clearly related to later memory performance, and the functions were very similar in slope for young and older Ss. For each person, young and old, the mean rating for items correctly matched was higher than the mean rating for items mismatched. Comparing the size of difference between these two means, as a measure of predictive accuracy, revealed no significant age

difference; the mean difference for young was .88 (S.D. = .30) while for old it was .83 (S.D. = .44).[1]

Accurate predictions of the relative memorability of items may result either from the individual having knowledge of his personal mnemonic processing of each pair, or from a knowledge of a population-wide, culturally-shared component (cf. Rabinowitz et al., 1982; Underwood, 1966). If the difference in ratings of matched and mismatched pairs results only from the population-wide component, one person's ratings could be used to predict another's matching performance about as well as his own. On the other hand, if the individual is, at least in part, monitoring the effectiveness of his own mnemonic processing, the difference in mean ratings of matched and mismatched items would decline when the ratings of a randomly yoked S were used to predict the matchings. With such a yoked procedure the mean difference in ratings correctly matched vs. those mismatched was very substantially reduced for young (from .88 to .26) and old (from .83 to .33).[1] The fact that nearly all remain positive indicates the existence of a shared population-wide component, but the large reductions for both ages indicate that much of the predictive accuracy for both age groups reflects the monitoring of the memorial effectiveness of that individual's processing. (The reductions were significant, $ps < .01$, but the interaction of age and yoked vs. own ratings did not approach significance.)

A second way to examine the accuracy of prediction is to compare the proportion of "non-3" ratings which were "correct", i.e., the total of "1s" and "2s" which were mismatched plus the total of "4s" and "5s" which were matched correctly, divided by the number of "non-3" ratings. Although the mean proportions, Young = .72 (S.D. = .09) and Old = .64 (S.D. = .18), were not significantly different by t-test, 8 of the 20 old Ss had proportions below the lowest of the young Ss. A Kolmogorov-Smirnov two-sample

test of the cumulative frequencies shows this difference to be significant ($p < .05$).

This evidence that the older Ss metamemory judgment were "less correct", despite the evidence that old were as good as young in judging relative memorability of items (as reflected in Figure 1 and very similar differences in mean ratings of matched and mismatched for Young and Old), results from differences in the veridicality of their use of the rating scale. The following analysis demonstrates that older Ss tend to underestimate the difficulty of the task, or overestimate their level of performance on the pending memory task. For each S the predicted total number of correct matches was found by counting all the "5s" and "4s" plus half the "3s". Comparing the mean differences between this predicted number correct and the actual number of correct matches revealed that young Ss had a very small underestimate of their performance ($\bar{X}$ = 1.1 item) where as the older Ss substantially overestimated their performance ($\bar{X}$ = 14.0 items). Figure 2 provides a plot of predicted number correct vs. actual number of correct matches for each S.

Evaluation of Responses. Both young and old were quite accurate in the evaluation of their responses; Table 1 shows the frequencies of "guess", "think", and "sure" judgments as well as the conditional probabilities of correct matches given these evaluations.

Conclusions

The poorer performance of older Ss on this episodic memory task can not be reasonably attributed to deficiency in either of two metamemory judgments: a) knowledge at time of study of the relative memorability (or difficulty) of particular items, or b) the ability to accurately monitor the accuracy of their responses at time of test. There does appear to be a metamemory deficit in the older Ss with respect to the absolute levels at

which they will be able to perform this task. These findings confirm both of the apparently contradictory earlier reports of a) no age difference in metamemory (of the item-by-item type, Rabinowitz et al., 1982) and b) age differences in metamemory (of the global-level-of-performance judgments, Murphy et al., 1981).

References

King, J.F., Zechmeister, E.B., & Shaughnessy, J.J. Judgments of knowing: The influence of retrieval practice. American Journal of Psychology, 1980, 93, 329-343.

Lachman, J.L., & Lachman, R. Age and the actualization of world knowledge. In Poon, L., et al. (Ed.), New Directions in Memory and Aging. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1980.

Murphy, M.D., Sanders, R.E., Gabriesheski, A.S., & Schmitt, F.A. Metamemory in the aged. Journal of Gerontology, 1981, 36, 185-193.

Paivio, A., Yuille, J.C., & Madigan, S. Concreteness, imagery and meaningfulness values for 925 nouns. Journal of Experimental Psychology Monograph, 1968, 76(1, Pt. 2).

Rabinowtiz, J.C., Ackerman, B.P., Craik, F.I.M., & Hinchley, J.L. Aging and metamemory: The roles of relatedness and imagery. Journal of Gerontology, 1982, 37, 688-695.

Sanquist, T.F., Rohrbaugh, J.W., Syndulko, K., & Lindsley, D.B. Electrocortical signs of levels of processing: Perceptual analysis and recognition memory. Psychophysiology, 1980, 17, 568-576.

Underwood, B.J. Individual and group predictions of item difficulty for free learning. Journal of Experimental Psychology, 1966, 71, 673-679.

Footnote

[1]If these difference scores are adjusted by the variability in the individual's ratings, e.g., $\left(\frac{\bar{X} \text{ rating matches} - \bar{X} \text{ rating mismatches}}{\text{S.D. of ratings}}\right)$ the present results are unchanged (cf. King, et al., 1980).

Table 1

Frequencies of "Guess", "Think", and "Save" in the response evaluation task

(and conditional probabilities of correct matching given each)

	Response			
	Guess	Think	Sure	% Correct Matches "Sure"
Young:	460	216	524	71
	(.04)	(.44)	(.96)	
Old:	845	159	294	77
	(.04)	(.40)	(.91)	

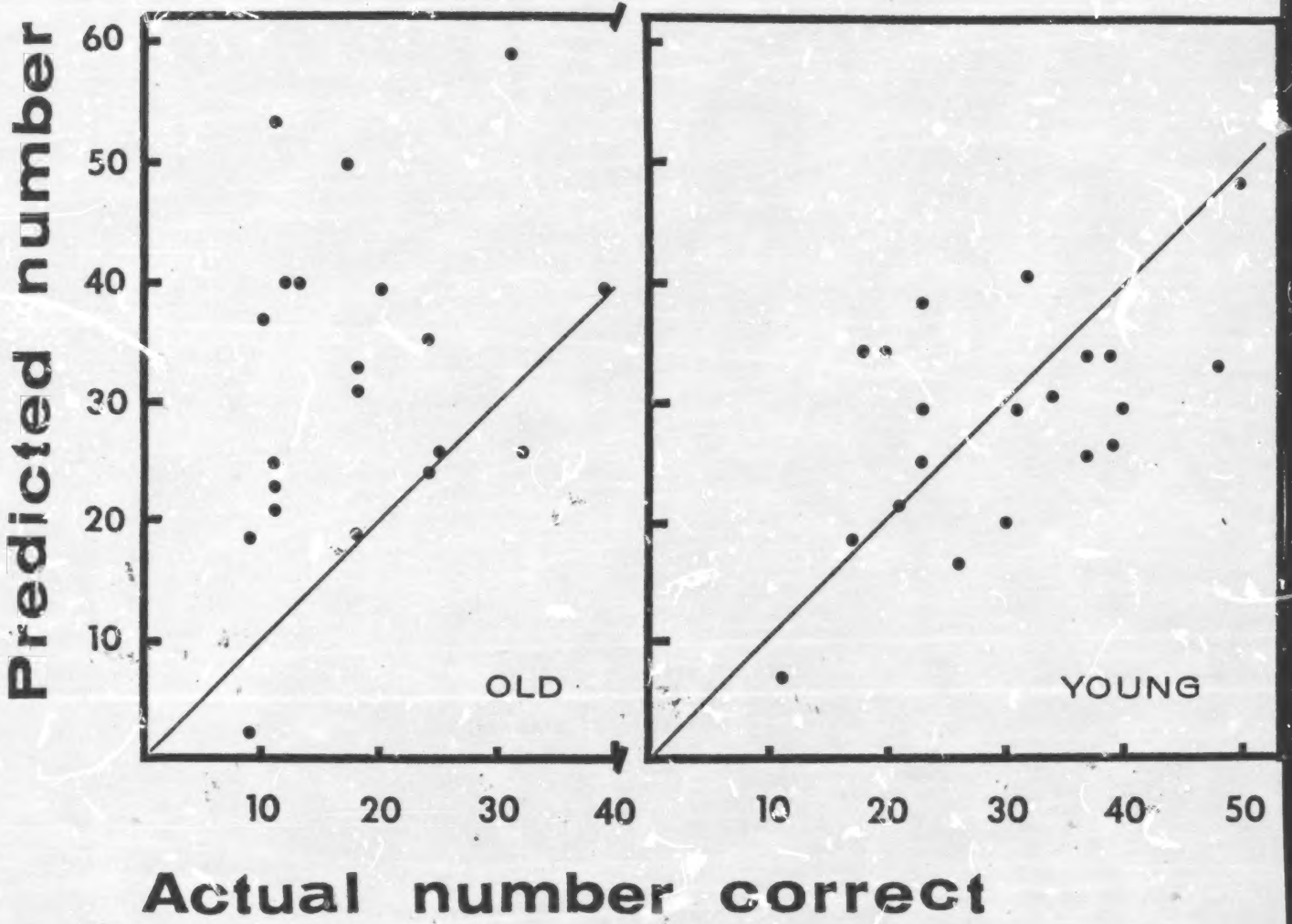

Figure 2. Predicted number of correct associative matches, based on the ratings given, versus the acutal number correct for each individual.

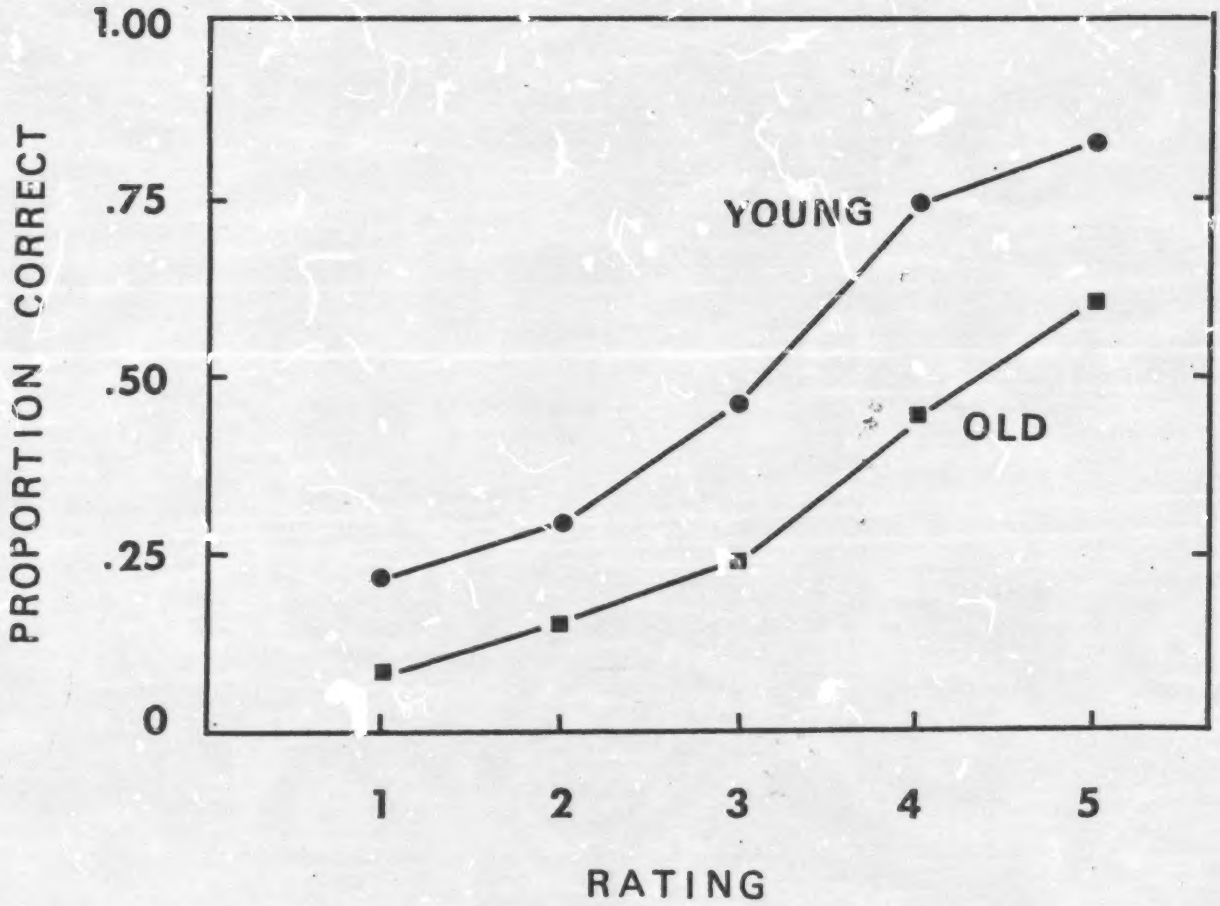

Figure 1. Conditional probability of correct associative match given the rating of the pair.